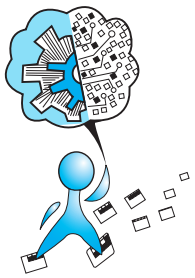

Algorithmic Bias and Multi-label Classification: Topics of Importance in Machine Learning and Data Science

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Machine learning (ML) [1] and data science (DS) are two important dominating fields in recent days in the area of computer science and information technology. They are increasingly used as effective and efficient tools for solving all most all problems occurring in every sphere of life. The dramatic growth of algorithmic decision making under the umbrella of machine learning and decision science continues to gain momentum in marketing, research in this stream is still inadequate despite the devastating, asymmetric and oppressive impacts of algorithmic bias on various customer groups. There are advantages to algorithmic decision-making; unlike human, ML and DS agents does not become tired. However, like human, ML and DS agents are vulnerable to discrimination that renders its decisions ''unfair". Discrimination is the unfair treatment of individuals based on specific characteristics, also called sensitive features such as gender and race. It has been found that machine learning not only leads to unexpected results with bias, but also has amplified algorithmic bias. Extensive studies have been conducted to achieve the fairness in ML and DS model, and generally categorized in three approaches: preprocessing, in-processing and post-processing. Pre-processing solves the problem by eliminating the bias present in the training data itself. In-processing reduces the bias by adding a constraint to the learning algorithm even if there is a bias in the data. Postprocessing ensues decisions themselves. Readers may refer [2] for more details on algorithmic bias. Now we will turn our attention to second part of our topic of discussion i.e., multilabel classification.

Multilabel classification, an equally important topic of ML and DS aims to build classification model for instances assigned with multiple-labels simultaneously which is a common learning paradigm in real world application [3]. It deals with multiple labels being assigned to every instance in a dataset which can be assigned to more than one class simultaneously. Multi-label classification tasks exist in many real-world applications, such as, gene classification in bioinformatics[2], medical diagnosis, document classification, music annotation, image recognition, and so on. All these applications require effective and efficient multilabel classification algorithms. There exist a variety of multilabel classification algorithms[3]. The existing multilabel classification algorithms are developed based on two basic approaches like algorithm adaptation and problem transformation method. Problem transformation method is to transfer multi-label classifications into multiple traditional single label classifications, specifically, multiple binary classifications. After a multilabel classification problem is transferred into multiple binary classification problem then, all the traditional classification algorithms can be applied directly to build a classifier for each binary dataset and make prediction for its correlated test instances. For more details about multilable classification, readers may refer a tutorial authored by Gibaja and Ventura [3].

References:

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